

## **SCDHEC *Earth Today***

**Lesson Grade Level: 7**

**Lesson Title:** How Good Are Hybrid Cars?

**SC State Science Standard(s):**

- (I, C, 5, a) Describe examples of constraints on technological design.
- (I, C, 5, b) Explain why constraints on technological designs are unavoidable.

**Segment Link:**

In the first part when the people are discussing hybrid cars.

**Lesson Overview:**

This is a follow-up to the video using the question posed in the standards above as the focus of the discussion about the advantages and disadvantages of the electric car design compared with conventional automobiles. The teacher should also provide additional information about hybrid cars prior to the discussion to augment the information from the video.

**Background:**

Electric cars are being developed as an alternative to polluting, costly fossil fuel cars. Since they use electricity to power the motor, no gasoline is burned. Two of the by-products of fossil fuel use are nitrogen oxide (NOX) and volatile organic compounds (VOCs) which combine to form ozone (ozone is helpful up high in the atmosphere, but near the surface, it causes health problems). NOX also produced by cars combines with moisture in the air to form components of acid rain, NOX and sulfur dioxide (SO<sub>2</sub>). The burning of fossil fuels also releases high amounts of sulfur into the air which adds to smog. However, current automobiles use gasoline since it has traditionally been cheaper and more efficient than electric cars. However, with the increasing demand for a cleaner environment, the price of gasoline has gone up to pay for additives that are supposed to bring pollution down. Certain states have also mandated emissions standards to lower the amount of pollution cars produce, which has made car owners pay more for making their cars environmentally friendly. More recently, the cost of gasoline has also increased due to production demands. This has increased the demand for an environmentally friendly alternative to costly, polluting fuel. Electric cars are considered one possible alternative. They use electricity, which does not by itself produce air pollution. However, such cars are still more costly as they are still being developed and are not standard. They also need to be recharged when the battery power is low. While it is easy to fill up your gas tank, fully recharging car batteries can take hours. This greatly reduces the range of the vehicle (how far they can go before needing to be recharged) if you need to stop and wait hours to recharge. Also, many electric motors cannot reach the speeds that gasoline-powered engines can. Hybrid cars are suggested as one alternative that not only runs on electricity, but also supplements that with a gasoline powered engine that not only adds power and speed, but also recharges the electrical battery when it is not being used. Hybrids increase gasoline efficiency and can get up to 50 miles per gallon.

**Lesson Plan:**

1. Following the video, the instructor can lead a discussion about the advantages and disadvantages of using electric cars.
2. Students should address the following points:
  - A. Pollution produced by regular cars

- B. Slower speed of electric cars
- C. Increasing cost of fuel
- D. Time needed to recharge
- E. Greater cost of electric cars
- F. Increasing emission controls and their costs

### **Additional Teacher Background:**

There are vehicles available today that reduce air pollution and increase fuel economy! Manufacturers are making several types of vehicles that either use alternative fuels, an electric motor, or an internal combustion/electric motor. Here are a few of the different types of alternative vehicles available now:

**Hybrid/Electric Vehicle (HEV)** – combination of an internal combustion engine and an electric motor. Advantages to driving an HEV:

- Twice the fuel economy of a conventional vehicle.
- Lower emissions and better for the environment.
- Uses regular gasoline, does not have to be plugged in and it recharges itself!

**Electric Vehicle (EV)** – totally electric vehicle that is powered by fuel cells and does require a charge. Advantages to driving an EV:

- The wait time to recharge a battery is not as long as it used to be.
- Total fuel economy, because gas is not necessary!
- An EV's contribution to air pollution is virtually zero, which is the best option for cities with high concentrations of air pollution.

**Alternative Fuel Vehicle (AFV)** – vehicle that uses an alternative fuel source other than petroleum. Advantages to driving an AFV:

- Better for the environment because it reduces the emissions of ozone and smog forming pollutants.
- Alternative fuels reduce the dependency on foreign oil.
- Some alternative fuels come from corn, soybean and other products, which increases the demand for these types of agricultural crops.

For more information on, hybrid/electric vehicles, electric vehicles and alternate fuel vehicles visit these websites:

[www.epa.gov/otaq/fuels.htm](http://www.epa.gov/otaq/fuels.htm)

[www.fueleconomy.gov](http://www.fueleconomy.gov)

[www.energy.gov/transportation/sub/altfuel.html](http://www.energy.gov/transportation/sub/altfuel.html)